

## Estimation of Provincial Tobacco Use in Thailand Using Multilevel Small Area Estimation from a National Probability Sample

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Monitoring tobacco use is one of the key tobacco control strategies proposed by World Health Organization to assess implementation of the Framework Convention on Tobacco Control. In Thailand, tobacco use surveillance is based on repeated nationally representative cross sectional surveys. While these surveys provide national estimates of tobacco use, they do not provide provincial level estimates because they were not designed with adequate provincial sample sizes. Provincial estimates of tobacco use are necessary for assessing local tobacco control policies. We used small area estimation (SAE) to estimate prevalence of current tobacco use in 76 provinces and Bangkok in Thailand with information from a national probability sample and census information and evaluated this approach used in tobacco surveillance. Multilevel logistic regression models with a provincial-level random effect were first estimated based on the Global Adult Tobacco Survey in Thailand and then applied to 2010 Thailand census data, i.e., aggregated number of people with demographic characteristics, to make predictions of current tobacco use for all target population groups in each province. The multilevel model provincial-level estimates were evaluated and validated by comparison to their direct survey estimates. Prevalence of current tobacco use at the provincial level varied by province. For men, the range was from 24.4% in Lamphun to 68.2% in Ranong (median= 46.5%). For women, the range was from 1.41% in Narathiwat to 24.7% in Buri Ram (median=6.46%). The standard deviation of the prevalence ranged from 0.02% to 0.06% (median=0.04%) for men and from 0.01% to 0.05% (median=0.03%) for women. The correlation between estimated prevalence using SAE and direct estimation was 0.966 and 0.919 for men and women respectively. In conclusion: Application of SAE to a Thailand nationally representative sample can be used for reliable estimation of prevalence of current tobacco use for all 76 provinces and Bangkok in Thailand.

**Key words:** Small area estimation, random effect model, prevalence, tobacco use, Thailand